PERMUTATION 11.4.2024

11 April 2024 17:36

3 types to Consider

10-15% * (I) Arrange vs Selections

5-10% (II) Derangements

70-80% (III) Calculations on # ______ 6s

$\boxed{400 \text{ to } 700}$ 660, 661-669 66

466, 566, 606, 616, 626, 636, 646, 656, 676, 686, 696

100 - 600

$U_n = 2n$ 2, 4, 6, 8 ...

$U_n = n$ 1, 2 ......

P&C QUESTIONS

1. If $\alpha = {}^mC_2$, then ${}^{\alpha}C_2$ is equal to
(a) ${}^{m+1}C_4$ (b) ${}^{m-1}C_4$ (c) $3\,{}^{m+2}C_4$ (d) $3\,{}^{m+1}C_4$

2. If ${}^nC_3 + {}^nC_4 > {}^{n+1}C_3$, then
(a) $n > 6$ (b) $n > 7$
(c) $n < 6$ (d) None of these

None

a) b

$$^{n+1}C_4 > {}^{n+1}C_3 \Rightarrow \frac{^{n+1}C_4}{^{n+1}C_3} > 1$$

$$\frac{n-2}{4} > 1 \qquad \boxed{n > 6}$$

$$\frac{\frac{(n+1)!}{(n-3)!\,4!}}{\frac{(n+1)!}{(n-2)!\,3!}} > 1$$

3. The value of $\sum_{r=0}^{n-1} {}^nC_r/({}^nC_r + {}^nC_{r+1})$ equals
(a) $n + 1$ (b) $n/2$
(c) $n + 2$ (d) None of these

4. The value of $\sum_{r=1}^{n} \frac{{}^nP_r}{r!}$ is
(a) 2^n (b) $2^n - 1$ (c) 2^{n-1} (d) $2^n + 1$

5. If ${}^{2n+1}P_{n-1} : {}^{2n-1}P_n = 3 : 5$, then n is equal to
(a) 4 (b) 6 (c) 3 (d) 8

6. The number less than 1000 that can be formed using the digits 0, 1, 2, 3, 4, 5 when repetition is not allowed is equal to
(a) 130 (b) 131
(c) 156 (d) 155

~~4 digit~~

3 digit $\underline{5} \times \underline{5} \times \underline{4} \rightarrow 100$
NO zero, any 5

2 digit $5 \times 5 \rightarrow 25$

6 131

7. The numbers greater than 1000 but not greater than 4000, which can be formed with the digits 0, 1, 2, 3, 4 (repetition of digits is allowed), are
(a) 350 (b) 375
(c) 450 (d) 576

8. A variable name in certain computer language must be either an alphabet or an alphabet followed by a decimal digit. The total number of different variable names that can exist in that language is equal to
(a) 280 (b) 290
(c) 286 (d) 296

9. The number of five-digit numbers that contain 7 exactly once is
(a) $(41)(9^3)$ (b) $(37)(9^3)$
(c) $(7)(9^4)$ (d) $(41)(9^4)$

10. The total number of flags with three horizontal strips in order, which can be formed by using 2 identical red, 2 identical green and 2 identical white strips, is equal to
(a) 4!
(b) $3 \times (4!)$

2 identical green and 2 identical white strips, is equal to

(a) 4!
(b) $3 \times (4!)$
(c) $2 \times (4!)$
(d) None of these

11. Let A be a set of $n (\geq 3)$ distinct elements. The number of triplets (x, y, z) of the elements of A in which atleast two coordinates same, is

(a) ${}^nP_3$ (b) $n^3 - {}^nP_3$ (c) $3n^2 - 2n$ (d) $3n^2 (n-1)$

12. The total number of six-digit numbers that can be formed, having the property that every succeeding digit is greater than the preceding digit, is

(a) ${}^9C_3$ (b) ${}^{10}C_3$ (c) ${}^9P_3$ (d) ${}^{10}P_3$

CNE

13. The number of four-digit numbers that can be made with the digits 1, 2, 3, 4 and 5 in which atleast two digits are identical, is

(a) $4^5 - 5!$ (b) 505
(c) 600 (d) None of these

5^4 number

Cases when no Repeat → → → 5!

$5^4 - 5! \rightarrow 625 - 120 \rightarrow \underline{505}$

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$10 \cdot 10 \cdots 10^{10}$

14. The total number of five-digit numbers of different digits in which the digit in the middle is the largest, is

(a) $\sum_{n=4}^{9} {}^nP_4$ (b) 33(3!)
(c) 30(3!) (d) None of these

15. The number of nine non-zero digit numbers such that all the digits in the first four places are less than the digit in the middle and all the digits in the last four places are greater than that in the middle, is

(a) 2(4!) (b) 3(7!)/2 (c) 2(7!) (d) ${}^4P_4 \times {}^4P_4$

16. The total number of three-digit numbers, the sum of whose digits is even, is equal to

(a) 450 (b) 350 (c) 250 (d) 325

17. The permutations of n objects taken
(i) atleast r objects at a time
(ii) atmost r objects at a time
(if repetition of the objects is allowed)
are respectively

(a) $\frac{n^{n-r+1}}{n-1}$ and $\frac{n^{r+1}-1}{n-1}$

(b) $\frac{n^{n-r+1}}{n-1}$ and $\frac{n^r(n^{r+1}-1)}{n-1}$

(c) $\frac{n^r(n^{n-r}-1)}{n-1}$ and $\frac{n^{r+1}-1}{n-1}$

(d) None of these

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18. How many ten-digit numbers can be written by using the digits 1 and 2?

(a) ${}^{10}C_1 + {}^9C_2$ (b) 2^{10}
(c) ${}^{10}C_2$ (d) 10!

$\boxed{2}$ 2 2 2 ... 2

2^{10}

19. A five-digit number divisible by 3 is to be formed using the numerals 0, 1, 2, 3, 4 and 5 without repetition. The total number of ways this can be done is
(a) 216 (b) 240 (c) 600 (d) 3125

20. The total number of 9-digit numbers which have all different digits is
(a) 10! (b) 9! (c) $9 \cdot 9!$ (d) $10 \cdot 10!$

21. Eight chairs are numbered 1 to 8. Two women and three men wish to occupy one chair each. First the women choose the chairs from amongst the chairs marked 1 to 4 and then the men select the chairs from amongst the remaining. The number of possible arrangements is
(a) ${}^4C_3 \times {}^4C_2$ (b) ${}^4C_2 \times {}^4P_3$
(c) ${}^4P_2 \times {}^4P_3$ (d) None of these

22. From 4 Officers and 8 Jawans, a committee of 6 is to be chosen to include exactly one officer. The number of such committee is
(a) 160 (b) 200 (c) 224 (d) 300

23. Seven different lecturers are to deliver lectures in seven periods of a class on a particular day. A, B and C are three of the lecturers. The number of ways in which a routine for the day can be made such that A delivers his lecture before B and B before C, is
(a) 420 (b) 120
(c) 210 (d) None of these

24. The number of arrangements of letters of the word 'BANANA' in which the two N's do not appear together is
(a) 40 (b) 60 (c) 80 (d) 100

25. How many different nine-digit numbers can be formed from the number 223355888 by rearranging its digits, so that odd digits occupy even positions?
(a) 16 (b) 36 (c) 60 (d) 180

26. Let $A = \{x \mid x \text{ is a prime number and } x < 30\}$. The number of different rational numbers whose numerator and denominator belong to A, is
(a) 90 (b) 180
(c) 91 (d) None of these

27. Let S be the set of all functions from the set A to the set A. If $n(A) = k$, then $n(S)$ is
(a) $k!$ (b) k^k (c) $2^k - 1$ (d) 2^k

28. Let A be the set of 4-digit numbers $a_1 a_2 a_3 a_4$, where $a_1 > a_2 > a_3 > a_4$, then $n(A)$ is equal to
(a) 126 (b) 84
(c) 210 (d) None of these

29. An n-digit number is a positive number with exactly n-digits. Nine hundred distinct n-digit numbers are to be formed using only the three digits 2, 5 and 7. The smallest value of n for which this is possible is
(a) 6 (b) 7 (c) 8 (d) 9

$A \to A$

$n(A) = K$

$n(S)$

~~Domain~~

Co-domain

$A \to B$

$1 \to K$

$2 \to K$

$K \cdot K \cdot K - - \cdot K$ times $\Rightarrow K^K$

30. The number of 5-digit telephone numbers having atleast one of their digits repeated is

(a) 90000 (b) 100000 (c) 30240 (d) 69760

31. If letters of the word 'KUBER' are written in all possible orders and arranged as in a dictionary, then rank of the word 'KUBER' will be

(a) 67 (b) 68 (c) 65 (d) 69

32. The total number of 4-digit numbers that are greater than 3000, that can be formed using the digits 1, 2, 3, 4, 5, 6 (no digit is being repeated in any number) is equal to

(a) 120 (b) 240 (c) 480 (d) 80

33. In a country, no two persons have identical set of teeth and there is no person without a tooth, also no person has more than 32 teeth. If shape and size of tooth is disregarded and only the position of tooth is considered, then maximum population of that country can be

(a) 2^{32} (b) $2^{32} - 1$

(c) Cannot be determined (d) None of these

34. n different toys have to be distributed among n children. Total number of ways in which these toys can be distributed, so that exactly one child gets no toy, is equal to

(a) $n!$ (b) $n! \cdot {}^nC_2$

(c) $(n-1)! \cdot {}^nC_2$ (d) $n! \cdot {}^{n-1}C_2$

35. The total number of permutations of k different things, in a row, taken not more than r at a time (each thing may be repeated any number of times) is equal to

(a) $k^r - 1$ (b) k^r (c) $\frac{k^r - 1}{k - 1}$ (d) $\frac{k(k^r - 1)}{(k - 1)}$

36. A person predicts the outcome of 20 cricket matches of his home team. Each match can result either in a win, loss or tie for the home team. Total number of ways in which he can make the predictions, so that exactly 10 predictions are correct, is equal to

(a) ${}^{20}C_{10} \cdot 2^{10}$ (b) ${}^{20}C_{10} \cdot 3^{20}$

(c) ${}^{20}C_{10} \cdot 3^{10}$ (d) ${}^{20}C_{10} \cdot 2^{20}$

37. A team of four students is to be selected from a total of 12 students. Total number of ways in which team can be selected such that two particular students refuse to be together and other two particular students wish to be together only, is equal to

(a) 220 (b) 182

(c) 226 (d) None of these

38. The total number of numbers that are less than $3 \cdot 10^8$ and can be formed using the digits 1, 2, 3, is equal to

(a) $\frac{1}{2}(3^9 + 4 \cdot 3^8)$ (b) $\frac{1}{2}(3^9 - 3)$

(c) $\frac{1}{2}(7 \cdot 3^8 - 3)$ (d) $\frac{1}{2}(3^9 - 3 + 3^8)$

Total digit → 9

$(3^1 + 3^2 + 3^3 + \ldots + 3^8) + 2 \cdot 3^8$

$\Rightarrow \frac{3(3^8 - 1)}{3 - 1} + 2 \cdot 3^8$

$\Rightarrow \frac{3 \cdot 3^8 - 3 + 4 \cdot 3^8}{2}$

$\Rightarrow \frac{7 \cdot 3^8 - 3}{2}$

39. Four couples (husband and wife) decide to form a committee of four members. The number of different committees that can be formed in which no couple finds a place, is

(a) 10 (b) 12 (c) 14 (d) 16

40. In an examination of 9 papers, a candidate has to pass in more papers than the number of papers in which he fails in order to be successful. The number of ways in which he can be unsuccessful, is

(a) 255 (b) 256 (c) 193 (d) 319

41. The number of 5-digit numbers that can be made using the digits 1 and 2 and in which atleast one digit is different, is

(a) 30 (b) 31

(c) 32 (d) None of these

42. In a club election, the number of contestants is one more than the number of maximum candidates for which a voter can vote. If the total number of ways in which a voter can vote be 62, then the number of candidates is

(a) 7 (b) 5

(c) 6 (d) None of these

43. Two players P_1 and P_2 play a series of '$2n$' games. Each game can result in either a win or loss for P_1. Total number of ways in which P_1 can win the series of these games, is equal to

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(a) $\frac{1}{2}(2^{2n} - {}^{2n}C_n)$
(b) $\frac{1}{2}(2^{2n} - 2 \cdot {}^{2n}C_n)$
(c) $\frac{1}{2}(2^{n} - {}^{2n}C_n)$
(d) $\frac{1}{2}(2^{n} - 2 \cdot {}^{2n}C_n)$

44. In the decimal system of numeration, the number of 6-digit numbers in which the sum of digits is divisible by 5, is

(a) 180000
(b) 540000
(c) 5×10^5
(d) None of these

45. The number of possible outcomes in a throw of n ordinary dice in which atleast one of the dice shows an odd number, is

(a) $6^n - 1$
(b) $3^n - 1$
(c) $6^n - 3^n$
(d) None of these

46. The number of different matrices that can be formed with elements 0, 1, 2 or 3, each matrix having 4 elements, is

(a) 3×2^4
(b) 2×4^4
(c) ~~3×4^4~~
(d) ~~None of these~~ 4^{12}

47. There are 20 questions in a question paper. If no two students solve the same combination of questions but solve equal number of questions, then the maximum number of students who appeared in the examination, is

(a) ${}^{20}C_9$
(b) ${}^{20}C_{11}$
(c) ${}^{20}C_{10}$
(d) None of these

0 1 2 3

4×4

4^4

0
1
2
3

0 1
2 3

0 2
1 3

0 3
1 2

4×1, 1×4, 2×2
each position change leads to a new matrix.
each → 4^4 ways × 3
$4^4 + 4^4 + 4^4 \to 3 \cdot 4^4$

48. The number of different pairs of words (□□□□, □□□) that can be made with the letters of the word 'STATICS' is

(a) 828 (b) 1260
(c) 396 (d) None of these

49. A shopkeeper sells three varieties of perfumes and he has a large number of bottles of the same size of each variety in his stock. There are 5 places in a row in his showcase. The number of different ways of displaying the three varieties of perfumes in the showcase is

(a) 6 (b) 50
(c) 150 (d) None of these

50. The number of ways in which 3 boys and 3 girls (all are of different heights) can be arranged in a line, so that boys as well as girls among themselves are in decreasing order of height from left to right, is

(a) 1 (b) 6!
(c) 20 (d) None of these

51. The number of words of four letters containing equal number of vowels and consonants, repetition allowed, is

(a) 105^2 (b) 210×243
(c) 105×243 (d) None of these

52. There are three teams each of a chairman, a supervisor and a worker three different companies. There are nine bonus of different denominations to be paid to these nine persons in all. In how many ways can this be done with due respect to superiority is given in every team?

(a) 865 (b) 129
(c) 1680 (d) None of these

53. If two numbers are selected from numbers 1 to 25, then the number of ways that their difference does not exceed 10 is

(a) 105 (b) 195
(c) ${}^{15}C_2$ (d) None of these

54. The number of ways in which a mixed double game can be arranged amongst 9 married couples, if no husband and wife play in the same game, is

(a) 756 (b) 1512
(c) 3024 (d) None of these

55. In a certain test, there are n questions. In this test 2^{n-i} students gave wrong answers to atleast i question, where $i = 1, 2, \ldots, n$. If the total number of wrong answers given is 2047, then n is equal to

(a) 10 (b) 11 (c) 12 (d) 13

56. The number of natural numbers which are less than $2 \cdot 10^8$ and which can be written by means of the digit 1 and 2, is

(a) 772 (b) 870 (c) 900 (d) 766

57. The number of times digit 3 will be written when listing the integer from 1 to 1000, is

(a) 269 (b) 300 (c) 271 (d) 302

58. Five balls of different colours are to be placed in three boxes of different sizes. Each box can hold all five balls. The number of ways in which we can place the balls in the boxes (order is not considered in the box) so that no box remains empty is

(a) 150 (b) 300
(c) 200 (d) None of these

59. The number of permutations of the letters of the word 'HINDUSTAN' such that neither the pattern 'HIN' nor 'DUS' nor 'TAN' appear, are

(a) 166674 (b) 168474 (c) 166680 (d) 181434

60. Two teams are to play a series of 5 matches between them. A match ends in a win or loss or draw for a team. A number of people forecast the result of each match and no two people make the same forecast for the series of matches. The smallest group of people in which one person forecasts correctly for all the matches will contain n people, where n is

(a) 81 (b) 243
(c) 486 (d) None of these

5^3

8 KKR vs 10 CSK

RCB 2008

2

5 match
3 forecast

$5^3 / 3^5$

W/L/D WLD - - - 5

$3 \times 3 \times$ - - 5 tm

61. In a class of 20 students, every student had a hand shake with every other student. The total number of hand shakes were

(a) 180 (b) 190 (c) 200 (d) 210

62. There are 10 persons among whom two are brother. The total number of ways in which these persons can be seated around a round table so that exactly one person sit between the brothers, is equal to

(a) (2!) (7!) (b) (2!) (8!)
(c) (3!) (7!) (d) (3!) (8!)

63. The number of ways in which a couple can sit around a table with 6 guests, if the couple take consecutive seats, is

(a) 1440 (b) 720
(c) 5040 (d) None of these

64. The number of different garlands, that can be formed using 3 flowers of one kind and 3 flowers of other kind, is

(a) 60 (b) 20
(c) 4 (d) 5

65. In the next world cup of cricket, there will be 12 teams, divided equally in two groups. Teams of each group will play a match against each other. From each group, 3 top teams will qualify for the next round. In this round each team will play against others once. Four top teams of this round will qualify for the semifinal round, where each team will play against the other three. Two top teams of this round will go to the final round, where they will play the best of three matches. The minimum number of matches in the next world cup will be

(a) 54 (b) 53
(c) 38 (d) None of these

66. The value of ${}^{10}C_5/{}^{11}C_6$, when numerator and denominator takes their greatest value, is

(a) $\frac{6}{11}$ (b) $\frac{5}{11}$ (c) $\frac{10}{6}$ (d) $\frac{10}{5}$

67. The number of subsets $\{1, 2, 3, ..., n\}$ having least element m and greatest element k, $1 \le m < k \le n$, is

(a) $2^{n-(k-m)}$ (b) 2^{k-m-2} (c) 2^{k-m-1} (d) 2^{k-m+1}

68. A class has 21 students. The class teacher has been asked to make n groups of r students each and go to zoo taking one group at a time. The size of group zoo i.e. the value of r) for which the teacher goes to the maximum number of times is (no group can go to the zoo twice)

(a) 9 or 10 (b) 10 or 11 (c) 11 or 12 (d) 12 or 13

69. A class has n students. We have to form a team of the students including atleast two students and also excluding atleast two students. The number of ways of forming the team is

(a) $2^n - 2n$ (b) $2^n - 2n - 2$

(c) $2^n - 2n - 4$ (d) None of these

70. From 4 gentlemen and 6 ladies, a committee of five is to be selected. The number of ways, in which the committee can be formed so that gentlemen are in majority, is

(a) 66 (b) 156

(c) 60 (d) None of these

71. If the total number of m elements subsets of the set $A = \{a_1, a_2, a_3, ..., a_n\}$ is k times the number of m elements subsets containing a_4, then n is

(a) $(m-1)k$ (b) mk

(c) $(m+1)k$ (d) None of these

72. An urn contains 3 red pens, 4 green pens and 6 yellow pens. The number of ways of drawing 4 pens from the urn, if atleast one red pen is to be included in the draw, is (all the pens are different from each other)

(a) 500 (b) 505

(c) 510 (d) None of these

73. Two numbers are chosen from 1, 3, 5, 7, ... , 147, 149 and 151 and multiplied together in all possible ways. The number of ways which will give us the product a multiple of 5, is

(a) 1710 (b) 2900

(c) 1700 (d) None of these

74. Let T_n denotes the number of triangles which can be formed using the vertices of a regular polygon of n sides. If $T_{n+1} - T_n = 21$, then n equals

(a) 5 (b) 7 (c) 6 (d) 4

75. If a polygon has 44 diagonals, then the number of its sides are

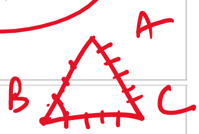
(a) 11 (b) 7

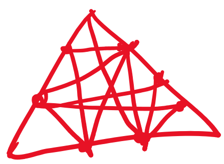
(c) 8 (d) None of these

Diagonals.

${}^nC_2 - n = 44$

$n = 11$





$^{12}C_3 - {}^3C_3 - {}^4C_3 - {}^5C_3$

✓✓✓

76. The sides AB, BC, CA of a ΔABC have 3, 4, 5 interior points, respectively on them. Total number of triangles that can be formed using these points as vertices, is equal to

(a) 135 (b) 145 (c) 178 (d) 205

77. $ABCD$ is a convex quadrilateral 3, 4, 5 and 6 points are marked on the sides AB, BC, CD and DA, respectively. The number of triangles with vertices on different sides is

(a) 270 (b) 220

(c) 282 (d) None of these

78. In a polygon, no three diagonals are concurrent. If the total number of points of intersection of diagonals interior to the polygon is 70, then the number of diagonals of the polygon is

(a) 20 (b) 28

(c) 8 (d) None of these

79. n lines are drawn in a plane such that no two of them are parallel and no three of them are concurrent. The number of different points at which these lines will cut, is

(a) $\sum_{k=1}^{n} k$ (b) $n(n-1)$

(c) n^2 (d) None of these

cut, is

(a) $\sum_{k=1}^{n} k$ (b) $n(n-1)$

(c) n^2 (d) None of these

80. If n objects are arranged in a row, then the number of ways of selecting three objects, so that no two of them are next to each other, is

(a) $\frac{(n-2)(n-3)(n-4)}{3}$ (b) ${}^{n-2}C_3$

(c) ${}^{n-2}C_3 + {}^{n-3}C_2$ (d) None of these

81. There are three coplanar parallel lines. If any p points are taken on each of the lines, the maximum number of triangles with vertices at these points is

(a) $3p^2(p-1)+1$ (b) $3p^2(p-1)$

(c) $p^2(4p-3)$ (d) None of these

82. In a plane, there are two families of lines $y=x+r$, $y=-x+r$, where $r \in \{0, 1, 2, 3, 4\}$. The number of squares of diagonals of length 2 formed by the lines, is

(a) 9 (b) 16

(c) 25 (d) None of these

83. Line L_1 contains l_1 point and line L_2 contains l_2 point. If the points on L_1 are joined to the points on L_2, then number of points of intersection of new lines, is

(a) ${}^{l_1}C_2 \times {}^{l_2}C_2$

(b) $4 \cdot {}^{l_1}C_2 \times {}^{l_2}C_2$

(c) $2 \cdot {}^{l_1}C_2 \times {}^{l_2}C_2$

(d) None of the above

84. The number of triangles whose vertices are at the vertices of an octagon but none of whose sides happen to come from the octagon, is

(a) 16 (b) 28 (c) 56 (d) 70

85. The sides AB, BC and CA of a ΔABC have a, b and c interior points on them respectively, then the number of triangles that can be constructed using these interior points as vertices, is

(a) $\frac{ab + bc + ca}{2}$ (b) $\Sigma\, ab\,(a + b - 2)$

(c) $\Sigma\, ab\,(a + b)$ (d) None of these

86. The number of points in the cartesian plane with integral coordinates satisfying the inequalities $|x| \le k$, $|y| \le k$, $|x - y| \le k$, is

(a) $(k + 1)^3 - k^3$ (b) $(k + 2)^3 - (k + 1)^3$

(c) $(k^2 + 1)$ (d) None of these

87. Given 5 different green dyes, 4 different blue dyes and 3 different red dyes. The number of combinations of dyes, which can be chosen taking atleast one green and one blue dye, is

(a) 3600 (b) 3720

(c) 3800 (d) None of these

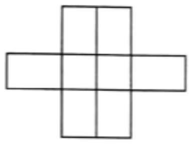
12×9

$12 \times 9 + 11 \times 8 + 10 \times 7 + \cdots +$

$108 + 88 + 70 \quad 4 \times 1$

$+ - - -$

88. Six X's have to be placed in the squares of the figure given below such that each row contains atleast one X'. The number of ways in which this can be done is



(a) 26 (b) 27

(c) 22 (d) None of these

89. The total number of six-digit numbers $x_1x_2x_3x_4x_5x_6$ having the property $x_1 < x_2 \le x_3 < x_4 < x_5 \le x_6$, is

(a) ${}^{10}C_6$ (b) ${}^{12}C_6$

(c) ${}^{11}C_6$ (d) None of these

90. A class contains three girls and four boys. Every Saturday five students go on a picnic, a different group of students is being sent each week. During the picnic, each girl in the group is given doll by the accompanying teacher. All possible groups of five have gone once, the total number of dolls the girls have got, is

(a) 21 (b) 45 (c) 27 (d) 24

91. The total number of ways of selecting two numbers from the set $\{1, 2, 3, 4, ..., 3n\}$, so that their sum of divisible by 3, is

(a) $\frac{2n^2 - n}{2}$ (b) $\frac{3n^2 - n}{2}$ (c) $2n^2 - n$ (d) $3n^2 - n$

92. If $r > p > q$, the number of different selections of $p + q$ things taking r at a time, where p things are identical and q other things are identical, is

(a) $p + q - r$ (b) $p + q - r + 1$

(c) $r - p - q + 1$ (d) None of these

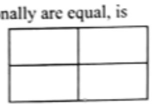
93. The number of proper divisors of $2^p \cdot 6^q \cdot 15^r$ is

(a) $(p+q+1)(q+r+1)(r+1)$
(b) $(p+q+1)(q+r+1)(r+1)-2$
(c) $(p+q)(q+r)r-2$
(d) None of the above

94. The number of even proper divisors of 1008 is

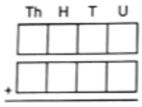
(a) 23 (b) 24
(c) 22 (d) None of these

95. The number of ways to fill each of the four cells of the table with a distinct natural number such that the sum of the numbers is 10 and the sum of the numbers places diagonally are equal, is



(a) $2! \times 2!$ (b) $4!$
(c) $2(4!)$ (d) None of these

96. In the figure, two 4-digit numbers are to be formed by filling the places with digits. The number of different ways in which the places can be filled by digits so that the sum of the numbers formed is also a 4-digit number and in no place the addition is with carrying, is



(a) 55^4 (b) $36 \cdot (55)^3$
(c) 45^4 (d) None of these

97. A bag contains 2 apples, 3 oranges and 4 bananas. The number of ways in which 3 fruits can be selected, if atleast one banana is always in the combination (assume fruit of same species to be alike) is

(a) 6 (b) 10 (c) 29 (d) 7

98. The number of divisors of the number 38808 (excluding 1 and the number itself), is

(a) 70 (b) 72
(c) 71 (d) None of these

* **99.** The number of integral solutions of $x_1 + x_2 + x_3 = 0$, with $x_i \geq -5$, is

(a) $^{15}C_2$ (b) $^{16}C_2$ (c) $\boxed{^{17}C_2}$ (d) $^{18}C_2$

$x_i \geq -5$
$x_i + 5 \geq 0$
→ here RHS → 15

$\boxed{x_1 + x_2 + x_3} = 10$
$^{10+3-1}C_{3-1}$
$^{15+3-1}C_{3-1}$
$\rightarrow {}^{17}C_2$

* **100.** If 33! is divisible by 2^n, then the maximum value of n is equal to

(a) 30 (b) 31 (c) 32 (d) 33

$\frac{33!}{2^n}$ G.I.F 2

$\left[\frac{33}{2}\right] + \left[\frac{33}{4}\right] + \left[\frac{33}{8}\right] + \left[\frac{33}{16}\right] + \left[\frac{33}{32}\right] = 31$

101. Let p be a prime number such that $p \geq 3$. Let $n = p! + 1$. The number of primes in the list
$n+1, n+2, n+3, \ldots, n+p-1$ is

(a) $p-1$ (b) 2
(c) 1 (d) None of these

102. A person writes letters to 6 friends and addresses the corresponding envelopes. The number of ways in which all 5 letters can be placed in wrong envelopes, is
(a) 264 (b) 210
(c) 206 (d) None of these

$^6C_5 \cdot 5!\left(1 - \frac{1}{1!} + \frac{1}{2!} - \frac{1}{3!} + \frac{1}{4!} - \frac{1}{5!}\right)$

$= 720\left(\frac{1}{2} - \frac{1}{6} + \frac{1}{24} - \frac{1}{120}\right)$

$= 720\left(\frac{60-20+5-1}{120}\right)$

$= 264$

103. The number of ways in which $m+n\ (n \le m+1)$ different things can be arranged in a row such that no two of the n things may be together, is
(a) $\frac{(m+n)!}{m!\,n!}$ (b) $\frac{m!\,(m+1)!}{(m+n)!}$
(c) $\frac{m!\,n!}{(m-n+1)!}$ (d) None of these

104. Number of divisors of the form $4n+2\ (n \ge 0)$ of the integer 240, is
(a) 4 (b) 8
(c) 10 (d) 3

105. Total number of non-negative integral solutions of $x_1 + x_2 + x_3 = 10$ is equal to
(a) $^{12}C_3$ (b) $^{10}C_3$
(c) $^{12}C_2$ (d) $^{10}C_2$

$^{10+3-1}C_{3-1} = {}^{12}C_2$

106. Total number of positive integral solutions of $x_1 + x_2 + 2x_3 = 15$ is equal to
(a) 42 (b) 70
(c) 32 (d) None of these

$x_1 + x_2 = 15 - 2x_3$ $\qquad x_3 \to 1, 2 \ldots 7$

Let, $x_3 = r$

$x_1 + x_2 = 15 - 2r$

$14 - 2r$

$\sum_{r=1}^{7}(14-2r) = 14\cdot 7 - 2\cdot\frac{7\times 8}{2}$

$= 98 - 56 = 42$

107. Total number of ways in which 15 identical blankets can be distributed among 4 persons, so that each of them gets atleast two blankets, is
(a) $^{10}C_3$ (b) $^{9}C_3$
(c) $^{11}C_3$ (d) None of these

108. Total number of 3 letter words that can be formed from the letter of the word 'AAAHNPRRS' is equal to
(a) 210 (b) 237 (c) 247 (d) 227

109. 15 identical balls have to be put in 5 different boxes. Each box can contain any number of balls. Total number of ways of putting the balls into box, so that each box contains atleast 2 balls, is equal to
(a) $^{9}C_5$ (b) $^{10}C_5$
(c) $^{6}C_5$ (d) $^{10}C_6$

110. The minimum marks required for clearing a certain screening paper is 210 out of 300. The screening paper consists of 3 sections each of Physics, Chemistry and Mathematics. Each section has 100 as maximum marks. Assuming, there is no negative marking and marks obtained in each section are integers, the number of ways in which a student can qualify the examination, assuming no cut-off limit, is
(a) $^{210}C_3 - {}^{90}C_3$
(b) $^{93}C_3$
(c) $^{213}C_3$
(d) $(210)^3$

111. Number of ways of distributing 10 identical objects among 8 persons (one or many persons may not be getting any object), is

(a) 8^{10} (b) 10^8 (c) ${}^{17}C_7$ (d) ${}^{10}C_8$

112. A bag contains 3 black, 4 white and 2 red balls, all the balls being different. The number of selections of atmost 6 balls containing balls of all the colours, is

(a) 42 (4!)

(b) $2^6 \times 4!$

(c) $(2^6 - 1)(4!)$

(d) None of the above

113. The number of ways to give 16 different things to three persons, so that B gets 1 more than A and C gets 2 more than B, is

(a) $\dfrac{16!}{4!\,5!\,7!}$

(b) $4!\,5!\,7!$

(c) $\dfrac{16!}{3!\,5!\,8!}$

(d) None of the above

114. The number of positive integral solutions of $x + y + z = n, n \in N, n \geq 3$, is

(a) ${}^{n-1}C_2$

(b) ${}^{n-1}P_2$

(c) $n(n-1)$

(d) None of the above

115. The number of non-negative integral solutions of $a+b+c+d=n, n \in N$, is

(a) ${}^{n-1}P_2$

(b) $\dfrac{(n+1)(n+2)(n+3)}{6}$

(c) ${}^{n-1}C_{n-4}$

(d) None of these

116. The number of points (x, y, z) in space, whose each coordinate is a negative integer such that $x+y+z+12=0$, is

(a) 385
(b) 55
(c) 110
(d) None of these

117. If a, b, c are three natural numbers in AP and $a+b+c=21$, then the possible number of values of the ordered triplet (a, b, c) is

(a) 15
(b) 14
(c) 13
(d) None of the above

118. If a, b, c, d are odd natural numbers such that $a+b+c+d=20$, then the number of values of the ordered 4-tuple (a, b, c, d) is

(a) 165
(b) 455
(c) 310
(d) None of the above

119. Number of ways in which three numbers in AP can be selected from 1, 2, 3,..., n, is

(a) $\left(\frac{n-1}{2}\right)^2$, if n is even0

(b) $\frac{n(n-2)}{4}$, if n is even

(c) $\frac{(n-1)^2}{4}$, if n is odd

(d) None of the above

120. Kanchan has 10 friends among whom two are married to each other. She wishes to invite five of them for a party. If the married couples refuse to attend separately, then the number of different ways in which she can invite five friends, is

(a) ${}^8C_5$ (b) $2 \times {}^8C_3$

(c) ${}^{10}C_5 - 2 \times {}^8C_4$ (d) None of these

121. A forecast is to be made of the results of five cricket matches, each of which can be a win or a draw or a loss for Indian team. Let

p = number of forecasts with exactly 1 error

q = number of forecasts with exactly 3 errors and

r = number of forecasts with all five errors

Then, the correct statement(s) is/are

(a) $2q = 5r$ (b) $8p = q$

(c) $8p = 5r$ (d) $2(p + r) > q$

122. If x is the number of 5-digit numbers sum of whose digits is even and y is the number of 5-digit numbers sum of whose digits is odd, then

(a) $x = y$
(b) $x + y = 90000$
(c) $x = 45000$
(d) $x < y$

123. If ${}^nC_\alpha = {}^nC_\beta$, then it may be true that

(a) $\alpha = \beta$
(b) $\alpha + \beta = 2n$
(c) $\alpha + \beta = n$
(d) All of the above

124. There are n married couples at a party. Each person shakes hand with every person other than her or his spouse. The total number of hand shakes must be

(a) ${}^{2n}C_2 - n$
(b) ${}^{2n}C_2 - (n - 1)$
(c) $2n(n - 1)$
(d) ${}^{2n}C_2$

125. There are n lines in a plane, no two of which are parallel and no three of which are concurrent. If plane is divided in u_n parts, then

(a) $u_4 = 11$
(b) $u_3 = 7$
(c) $u_2 = 3$
(d) $u_n = u_{n-1} + 4$